
The Changing Role of the Intermediary

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Broker/dealers face many challenges as the result of a rapidly changing environment, the need to offer a broad range of execution services, and the ever-essential requirement of managing execution costs and quality. As access to improved technology increases and barriers to creating new exchanges fall, however, intermediaries will need to refine their execution services to meet client demands. Providing liquidity and processing efficiency while offering smart execution services are capabilities that broker/dealers will continue to need.

The objective of this presentation is to address current issues in achieving best execution and relate them to the role of the broker/dealer. The points I am going to make deal with the issues most full-service brokers now face, and the discussion is organized around three themes: the environment for broker/dealers today and how it has changed from the standpoint of a liquidity provider; the execution services that are evolving to fit the profession's expanding needs and improved technology; and how to approach trading-cost analysis.

Effect of the Environment

A number of factors in the environment are affecting execution services and trading costs. Positive factors in the market include growth in total market capitalization, fund size, and fund turnover and the increase in the number of trading venues. On the negative side is the increase in stock volatility. In 2000, in particular, volatility had an impact on all investment managers—whether through tracking error, market-making costs, or the risks in portfolio strategies represented to clients. Unfortunately, in this time of high volatility, not only did risk increase in the market, but as risk

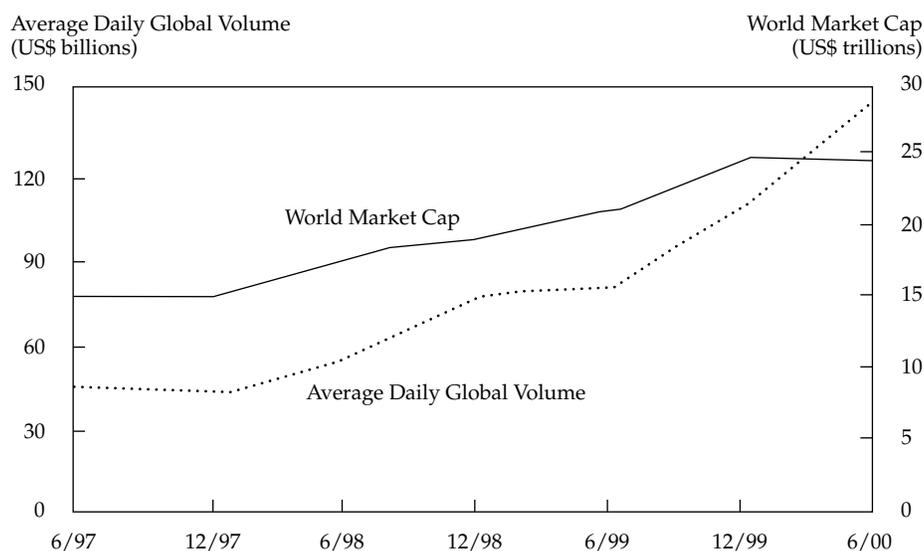
rose, equity prices either remained flat or decreased. Other factors influencing market participants are regulatory changes and technological and organizational improvements that have enhanced connections between broker/dealers and clients.

Growth. Growth has been occurring in equity market capitalization at the same time that the size of funds and turnover in those funds have been increasing. The demand for liquidity coming from institutions has been growing at a faster pace than market capitalization. Moreover, individual investors' trading activities have also expanded, so the portion of the market that institutions represent has shrunk and individual investors' access to the market has improved. These developments are positive, and access should continue to improve as technology is applied to the trading process.

As to the effect of market and turnover growth on liquidity providers, **Figure 1** shows how rapidly the global dollar volume traded in equities has been rising. Note that this volume graph does not even include emerging markets. Figure 1 maps the growth in trading volume against world market capitalization, as measured by the Financial Times Stock Exchange (FTSE) World Indexes, every six months. As of June 2000, the growth in market capitalization had been somewhat less than the growth in turnover. Dividing the average daily global volume traded on the left axis (more than \$135 billion in mid-2000) by the world market capitalization on the right axis, about \$25 trillion, shows that in global equity markets, about 0.5 percent of equity market capitalization trades on any given day.

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Figure 1. Growth in Global Volume Traded versus Global Market Capitalization, June 1997–June 2000



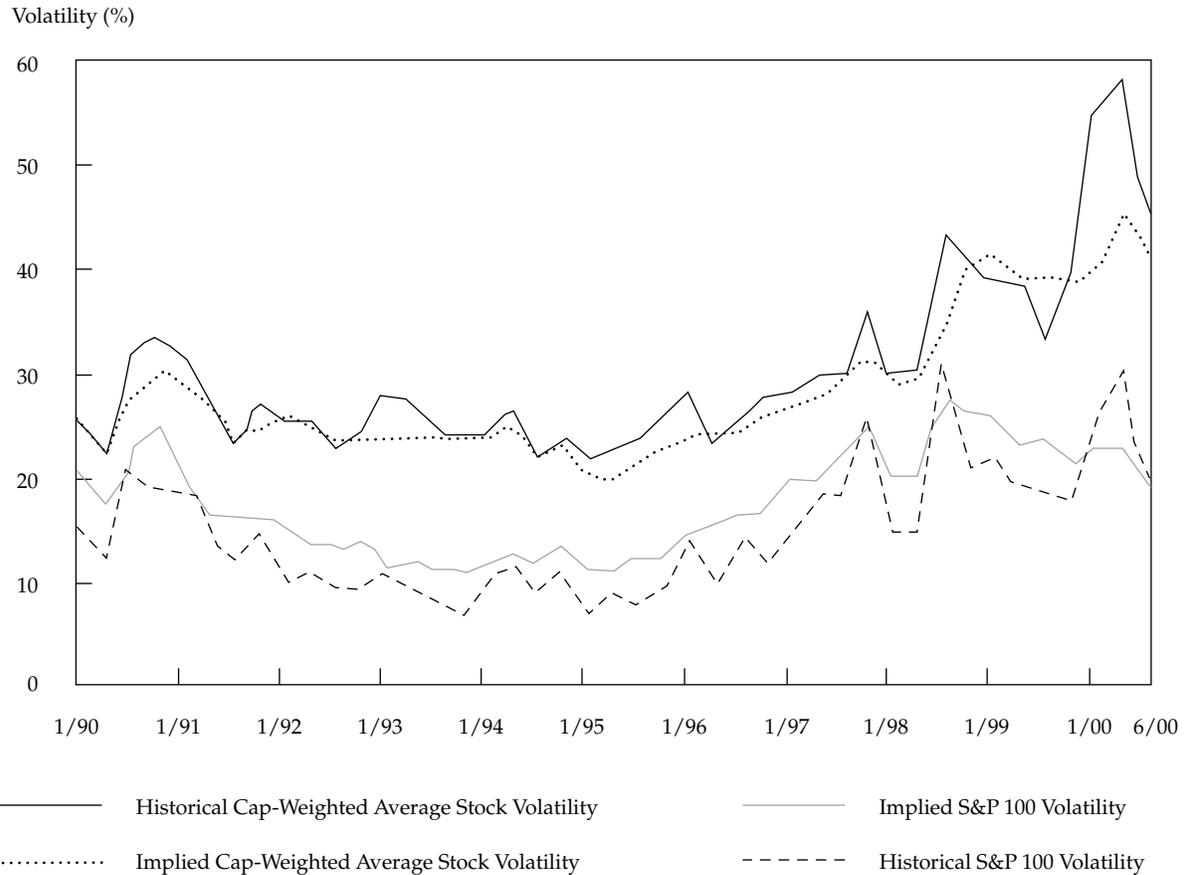
To put this small percentage of capitalization that regularly trades each day into context, consider the analogy of total equity market capitalization as two lakes: One lake is the group of people who are potential buyers, and the other is the people who are potential sellers. Between the two lakes is a narrow stream representing the capitalization that trades on any given day. The flow in that stream is 0.5 percent of the size of these two lakes. The challenge investors and market makers face is the occurrence of some type of disturbance—a change in fundamentals, a key earnings surprise, or unexpected economic news—that could cause a larger number than normal of the people in either lake to want to buy or sell stocks. In that case, the flow through the stream increases from 0.5 percent of each lake to perhaps 1 percent. The role of the liquidity provider and the exchanges is to help design and manage the channel between the two lakes to be adaptable to increased trading demands without causing an overflow situation.

Trading Venues. Another positive factor in the liquidity environment is the increase in trading venues. Traders on a buy-side or sell-side trading desk can choose from a variety of venues: principal programs and block trades (unwinding in the market, agency trades with clients, and trades with other principal program clients), exchange specialists, Nasdaq market makers, electronic communications networks (ECNs), crossing networks, POSIT, Instinet, crosses with active managers, natural crosses with brokers and clients, and internal fund crosses. For

principal programs or block trades—that is, capital commitment trades—a second round of trading choices exists once a position is taken. The dealer can cross the position in agency trades with clients, make other capital commitments, or unwind the trade in the market. This variety of choices has also produced some fragmentation of liquidity. Some argue this has reduced the benefits by increasing the cost of finding the best venue and counterparty.

Volatility. To assess the impact of stock volatility on liquidity providers and trading costs, **Figure 2** shows the volatility of the average stock in the S&P 100 Index (the top two lines) and the volatility of the S&P 100 itself (the bottom two lines). The implied-volatility series was derived from at-the-money three-month option values available in the marketplace; the historical volatility was calculated from daily return data over three-month periods. For the 1990–97 period, the average stock traded in the range of 20–30 percent volatility (annualized). Since about the end of 1998, that volatility range has moved up to 40–50 percent.

Part of the reason for this increase in volatility is that riskier stocks have a larger weight in investment portfolios and the market cap indexes to which these portfolios are benchmarked contain a great deal of technology stocks and other riskier securities. Another reason for the increase in volatility is that the fundamental economic factors affecting the prospects of all companies have become more uncertain than they were in the early 1990s. A third factor that will contribute to heightened volatility in the future

Figure 2. Volatility in U.S Stocks and the S&P 100, January 1990–June 2000

is Regulation Fair Disclosure (Regulation FD), which is discussed in the next section.

Stock volatility has been increasing in all regions of the world, not solely in the United States. **Figure 3** shows the volatility of the 20 largest stocks in the United States, Europe, and the Pacific FTSE indexes, together with the volatility of the respective regional indexes. Not all of the individual stock volatility has been passed through to index volatility, so the benchmarks investors use may not be picking up as much volatility as investors face in trading individual stocks.

The increase in volatility is expected to flow through to trading costs, which is another reason the measurement and analysis of trading costs and the selection of execution services are so important.

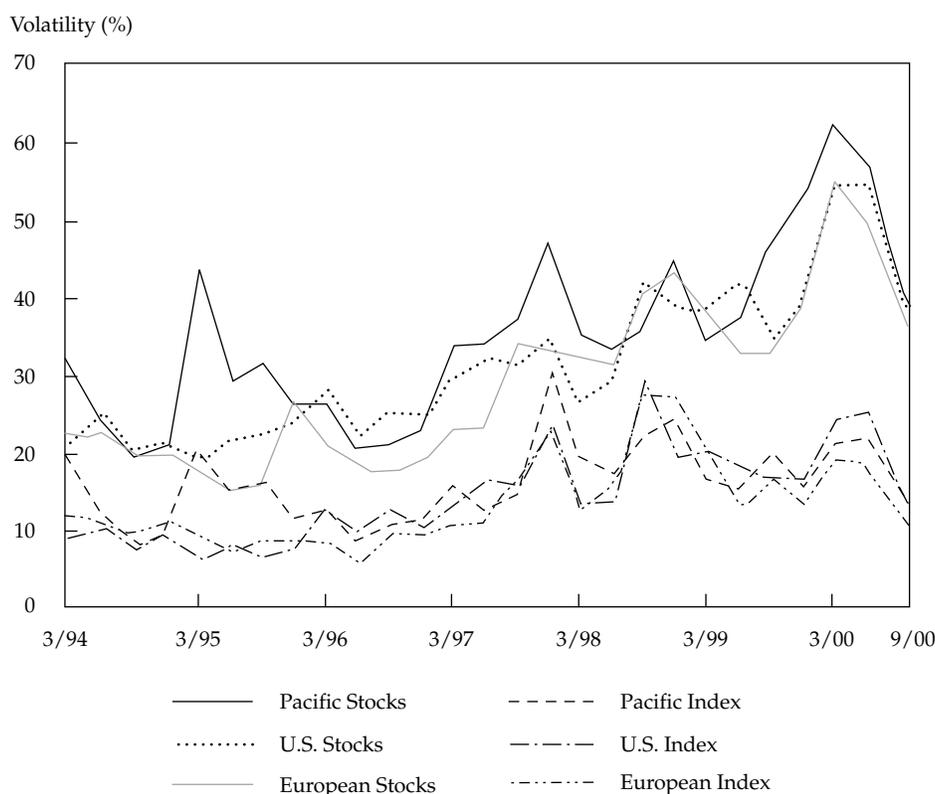
Regulatory Changes. An important regulatory factor confronting intermediaries and investors is Regulation FD, the regulation that requires corporations to disclose material information to all market participants at the same time. Two scenarios are possible with Regulation FD, both of which have the potential to increase stock volatility. One is that firms

may release *more* information on a regular basis to *more* investors, and everyone will receive a lot more information than in the past. The second scenario is that companies may release *less* information in a more sporadic manner than in the past for fear of violating Regulation FD. This scenario seems to be what is happening as corporations try to decide how to adapt to the new regulation.

In either scenario, the corporate information will need to be interpreted, and the interpretation will need to be disseminated by analysts with expertise in the companies. The interpretation cannot occur until the information is published, so noise effects on stock prices and risk to market participants may increase as investors try to interpret the information themselves before experts have an opportunity to add their perspective. So, Regulation FD is likely to increase price volatility and trading costs in the short run.

Because U.S. regulators have grown increasingly concerned with execution quality and disclosure of order-routing procedures, the SEC recently adopted two rules to improve public disclosure. Rule 11Ac1-5 requires specialists, market makers, ECNs,

Figure 3. Stock Volatility in World Regions: Largest 20 Stocks versus Indexes, March 1994–September 2000



the Nasdaq, and the national exchanges to make publicly available monthly electronic reports that include uniform statistical measures of execution quality. Rule 11Ac1-6 requires broker/dealers that route customer orders in equity and option securities to make publicly available quarterly reports that, among other things, identify where such orders are routed for execution.

Other regulatory changes that have had an impact on the role of the intermediary include decimalization of price quotes, increased flexibility in internalizing order flow, and the demise of Rule 390. With the abolition in May 2000 of the long-standing Rule 390, order flow for certain stocks is now free to go to places other than the NYSE for execution. Also, barriers to creating new exchanges are beginning to be lowered; multiple listing for options is one of the first signs. Cross-border exchanges will be, I hope, the next hurdle that is overcome.

Broker/Dealer–Client Connections. The capabilities of broker/dealers and clients have evolved both technologically and organizationally so that intermediaries are better connected to clients and to exchanges. Moreover, the exchanges are launching some products in 2001 that will improve connectiv-

ity. Order-management systems and electronic-trading protocols also help maintain clear connections between broker/dealers and clients.

More such improvements in global integration and in technology sharing at the intermediaries and in client offices are needed outside the United States. For example, a broker/dealer with offices in London, New York, Tokyo, and Hong Kong should be using technology to share information across trading desks; its systems can talk to each other. Client firms can do the same. Eventually, both can take advantage of the global integration of technology platforms and trading functions. Better integration of the trading side with the operations side is also needed.

Broker/Dealer Capital Commitment. Regarding capital commitment, some positive developments and some negative developments are visible. For example, although the overall risk level in the market is higher today, broker/dealers now have better tools to manage risk. Increased risk awareness is evident on the part of financial institutions, clients, and management firms. Most firms have created departments at the corporate level that are devoted to risk management because of the realization that the increase in risk is the result of fundamental factors

and that the globalization of companies means events in one place can have an impact around the world. A heightened attention to risk by senior managers and shareholders of financial institutions is apparent, together with a perception that earnings consistency is highly valued. This awareness has contributed to a reduction in the general appetite for risk in committing capital to provide liquidity. Also, a closer connection exists between the allocation of capital and the expectation of returns from investment opportunities where capital has been applied.

Broker/dealers have more hedging vehicles and more hedging expertise than in the past, and hedging has actually supplemented market liquidity. Many intermediaries have instituted quantitative trading strategies that regularly look for points of high liquidity demand in the marketplace. Even though the amount of capital committed by broker/dealers to block trades might not be as large as in prior years, the short-horizon, quantitative strategies of broker/dealers that take advantage of various pressures in supply and demand have become sources for supplying liquidity to the market. And retail order flow can also aid capital commitment in the market, but this benefit largely depends on which side of the market—supply or demand—the flow is originating.

Refining Execution Services

Intermediaries' execution services have evolved to meet changing environmental factors. Broker/dealers deal with many client types—hedge funds, index managers, pension funds, mutual funds, corporate investors, individual investors (through electronic access or through brokers), and traditional investment managers. Often, these varied client types exist within a single organization. Within each portfolio strategy, a wide range of potential trade sizes and compositions exists. Some clients must deal with regulatory constraints that affect which market is best for a certain transaction—transaction limits, for example, on index futures or other derivatives, limits on one fund buying another fund's product, and so on. Most large intermediaries have concluded that they must provide a broad range of execution capabilities. Every firm wants to be the one to which clients come to find the best source of liquidity for any particular trade or strategy.

Fragmentation in order execution (orders trading in several locations without interaction) will be an issue that liquidity providers must deal with in the foreseeable future. Some financial intermediaries, including Goldman, Sachs & Co., had been advocates of a central limit-order book, but we realized that many of the competitive and structural issues were clearly too difficult to overcome for it to become a

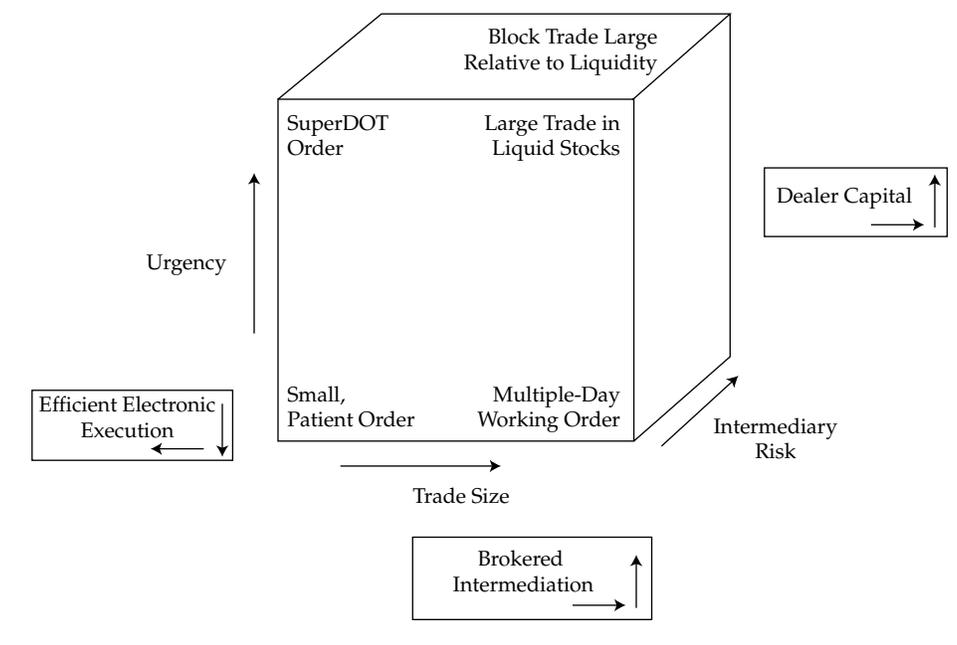
reality. We have accepted this reality and are now developing a business strategy that assumes fragmentation will exist for the next several years. In this environment, the intermediation function is the most important service we can offer our clients.

Client Demands. Some of the drive to offer diverse services also comes from clients who want to simplify their brokerage relationships. They are choosing firms on the basis of which provide the best sources of liquidity along with value-added research. Client trading demands have increased in complexity, and execution may require several forms of liquidity. Clients want an array of high and low "touch" (degree of broker involvement in execution) transaction services, and they want the intermediary to have a credible process for allocating transaction costs among services. Firms must state how they allocate and measure costs and then be able to communicate that information to clients.

Clients are demanding a vast range of services from their intermediaries. Capital commitments may be necessary for best execution at the level of a single stock trade, a large portfolio trade, or in market making, such as in broker specialist operations. Firms are also offering "best efforts" agency execution for larger trades—the ones above 10,000 shares—which require a decision about how to allocate the order over time and to which alternative trading venues. Another service being demanded by clients is small-order execution, for which the trader can use an ECN or another type of electronic trading mechanism. So, part of being a full-service broker involves offering services that assist clients in selecting among the execution options. How are the routing decisions made? How does the firm perform execution analysis?

Trades can be categorized by the intermediation strategy used. The three forms of intermediation can be thought of as buckets—one for dealer capital, one for brokered intermediation, and another for those trades that simply match the sources of supply and demand, in many cases electronically. For each type of intermediation, the firm needs a measure of execution quality specific to that form of intermediation and a measure for comparing execution among intermediation strategies.

Trades can be categorized according to size, urgency, and intermediary risk. **Figure 4** illustrates the various trade types based on these three dimensions. When all trades are fit into this box of trade size, urgency, and requirements of risk or capital commitment on the part of the intermediary, deciding how various orders should be placed for best execution is easier. More dealer capital will be involved in trades with higher levels of intermediary risk and urgency. A SuperDOT order or some other

Figure 4. Categorization of Trades by Size, Urgency, and Intermediary Risk

electronic mechanism may be appropriate for a small, urgent trade, but for large trades in liquid stocks, a broker might be a better choice because the good liquidity in the stock does not require a capital commitment on the part of the broker. At the back of the box are the trades that appear large relative to visible liquidity; using a broker with a high capital commitment would be the correct choice to execute these trades. In short, each trade can be scored and directed on the basis of its requirements along these three dimensions.

The Broker/Dealer's Challenge. Client demands require that execution intermediaries provide five critical services: market access and connectivity for all types of orders, "smart" execution services, liquidity, processing efficiency, and regular report cards on execution efficiency and performance. But simply providing these services is not enough; firms must strive for improvement and excellence in these tasks.

■ *Market access and connectivity.* Clients want a firm that can handle a full menu of market and order types. The client also wants to use the order flow of trades that are easily executed as a currency (soft dollars) in payment for investment services. These trades are the commodity portion of trading. The client needs this currency to pay for research, access to flow information, and key data. The client might want to trade through one firm but use a portion of the order flow as currency to pay for research or information from some other source.

■ *Smart execution services.* Execution services characterized as smart are mechanisms, tools, systems, or sales expertise that can identify best execution strategies, order routing, and sales trading. Sales traders will increasingly use technology to improve execution on the more difficult orders and to enhance productivity in dealing with less difficult orders; they will thus spend their time more efficiently.

Firms need metrics to measure the quality of their executions. Services such as those offered by broker analytics, the Plexus Group, Barra, or other providers can be used to quantitatively assess trades categorized by the characteristics of order size, liquidity in the particular stock, liquidity in the market, and any other characteristic that the trader has defined. The purpose of such an analysis is to receive feedback on prior trades and improve the firm's trading expertise. For example, traders, brokers, and investment managers would love to be able to type in a ticker symbol and see a profile or frequency distribution of the trading costs or execution costs of all the trades that they have done in that stock under similar market conditions.

■ *Liquidity.* Providing liquidity mandates competitive market making by the broker—that is, coverage, pricing, and sufficient outlets for liquidity at the broker/dealer. It also may involve making a capital commitment when doing so reduces client risk or cost and providing access and expertise in hedging principal risk. Intermediaries need to know about derivatives and hedging techniques so that they can make

markets reflecting efficient use of hedging and the potential, if any, for diversification of risk. Internal catalysts (such as intermediaries hedging their own principal risk) are the reason many intermediaries have built up their capabilities in derivatives, but the capabilities ultimately work to benefit clients.

■ *Processing efficiency.* Providing processing efficiency means having a seamless connection between clients and exchanges. It might include having the flexibility to pass a portion of the commission to other service providers when doing so is appropriate. Efficiency also involves speedy feedback to clients on the quality of execution after a trade.

■ *Report cards.* Finally, broker/dealers should provide regular report cards to clients regarding execution efficiency and services. Investment managers also need to review performance periodically with their clients, and a similar review relative to expectations, guidelines, and benchmarks should be conducted with the suppliers of execution services.

Completing the Market. The dealer has a role in completing the market when the existing market structure is incomplete on its own. Examples are internalization and the facilitation of large-scale transactions that are not easily executed in an exchange format. Another example is broker/dealer involvement in the portfolio trading business, which has evolved in part because of the lack of an efficient way for exchanges to deliver a diversified risk quote that is hedged in the futures market and also diversified among portfolio orders. Such transactions are easier for a dealer to provide when its traders have access to multiple sources of liquidity to hedge their risks. A similar function is evolving through the dealers' role in market making for exchange-traded funds. In these cases, upstairs market makers are at times able to create tighter markets than the exchanges because the dealers can evaluate trades in the context of their other positions, ability to hedge, anticipated customer flow, and willingness to be rewarded for committing capital.

The exchanges and the OTC markets, such as the Nasdaq, are also evolving to facilitate the needs of clients and intermediaries. In fact, the differences between the two have been blurred because technology has allowed for practices today that would not have been possible earlier.

■ *Exchange features of OTC trading.* For example, the Nasdaq has adopted many features of exchange trading for a variety of reasons. Some companies, such as Microsoft Corporation and Intel Corporation, trade on the Nasdaq primarily as legacies—because they have always done so. The question is whether they should be trading there or in an auction market. If corporations decided where to list on a

regular basis, many of the larger companies with high trading volume and a broad group of shareholders would probably choose to trade in an auction-type market. Smaller, less liquid companies would still need the dealer-type OTC trading format. Because the primary markets—the Nasdaq and the NYSE—want to retain their listings, however, they have begun to develop features that accommodate the other types of stocks trading on their platforms.

Some of the homogenizing of the primary markets has been spawned by regulators. For example, the Nasdaq now operates under the “display order” obligation. Generally, if a dealer receives an order that improves its quote, the dealer must display the order. In addition, the Manning Rule states that National Association of Securities Dealers' member firms with held limit orders for clients have an obligation to execute the client orders before any orders for the firms' proprietary accounts are executed at the same or better prices. Now, dealers have a way to handle working orders on the Nasdaq so that they can add a credit in their favor for the services of working that order. Finally, ECNs are really an exchange form of Nasdaq trading.

■ *Market-making features of exchanges.* Just as OTC markets have taken on exchange features, exchanges have adopted some dealer-like functions. For example, one could argue that the specialist role is a dealer function, although the capital commitment on the part of the specialist is limited. Also, when proprietary traders take positions in NYSE stocks, they are providing a market-making function.

The Rise of Mergers. Intermediaries are making acquisitions to fill in where they believe there is an execution gap. For example, Merrill Lynch & Company bought Herzog Heine Geduld, a Nasdaq market maker, and Goldman Sachs has acquired Spear, Leeds & Kellogg (SLK), a Nasdaq market maker and NYSE specialist. More such mergers and acquisitions are likely. In general, many U.S. specialist firms are not truly global institutions, so acquisitions enable the specialists to expand services in global markets.

The acquisition of SLK by Goldman Sachs is an example of the steps that intermediaries are taking to fill in the gaps in their existing range of services. SLK is primarily known as a stock and options specialist firm on the NYSE and Amex, yet other aspects of the firm's activities were as, if not more, important in the purchase. Most significant was the depth of SLK's market making in a broad range of Nasdaq securities, a function Goldman Sachs was not providing. Goldman Sachs wanted to be a wholesale provider of execution services and not limit its capabilities to large Nasdaq stocks. Also, the technology for handling

electronic order flow that SLK developed as part of its clearing and execution business was attractive. And its clearing operation filled a gap in the services offered by Goldman Sachs.

Another example of bolstering execution service range is the Goldman Sachs acquisition of the Hull Group. Hull is known primarily as an electronic options market-making firm. As an innovator in technology, it has brought sophisticated financial engineering skills and a proprietary risk-management methodology to our firm. Approximately two-thirds of the people employed at Hull are in the fields of technology or financial engineering, which is not the case at Goldman Sachs. The synergies created by adding Hull's market-making process for options, its databases, and its technology applications have strengthened our total package of services. Prior to this acquisition, Goldman Sachs had a heavier emphasis on large rather than small option orders, especially the complex transactions that require a combination of structuring and trading. Hull has added a wholesale approach for small-lot, standardized products. By combining the two specialties, Goldman Sachs was able to move out along the frontier of transaction services and open the door to previously unserved clients.

Improving Cost Measurement

Brokers are also adding resources and technology capabilities in the area of trading-cost analysis. This initiative is partly in response to regulatory requirements, but more important, it is a means to compete for execution services and respond to clients' interests. To deliver all the execution services being demanded today, an intermediary needs methods for understanding and analyzing execution costs and quality.

Transaction-cost measurement has several purposes:

- to estimate the cost of alternative trading strategies,
- to measure the cost of a trade after it has occurred,
- to demonstrate that a particular trading strategy provided best execution,
- to evaluate the usefulness of different trading venues, investment managers, and broker trading functions, and
- to evaluate trading costs associated with various investment styles.

These aspects of measuring transaction costs—for example, evaluating trading venues—involve *post-trade* analysis, but intermediaries also need to think ahead of the trades to anticipate which trading venue is right for a particular trade. What will be the contribution to the trading function of the broker/

dealer or the investment manager? What does the portfolio manager's style suggest for decisions about venue and costs? Is paying as much as 3 percent in trading costs for a quick execution reasonable for a momentum-style investment strategy that adds a lot of alpha?

One of the frustrations of trading-cost analysis is the desire for a "one size fits all" approach to measurement, which is a wish for a simple answer to a complex problem. No measurement method is completely satisfactory. Methods such as implementation shortfall, volume-weighted average price (VWAP) analysis, or open/high/low/close are limited in what they can reveal. Current approaches fulfill the demand for a number to report to clients, but these measures are not considered useful as decision-making tools for trading strategies or for altering investment strategies. Traders need more timely information that can be easily applied to their trading processes. Packaging the information more efficiently or delivering it more quickly would be a help.

Another frustration is that objectivity in trading-cost measurement is difficult to achieve. Those in the best position to measure costs are part of the process being evaluated. Plexus and the other transaction-cost measurement services do provide some objectivity, which is valuable. But they have the disadvantages of being farther away from the data and the markets and having to depend on receiving quality data from the people involved in the process.

Finally, the perceived benefits still do not match the price of measuring trading costs properly. People need to consider how valuable the function is to their investment strategies; only then will they realize the benefits.

Components of Realized Cost. The primary factors affecting trading costs are the market environment, trading strategy, portfolio characteristics, and client strategy or context. Trading-cost analysis involves pretrade cost assessment, which typically does not incorporate the trading time horizon or degree of urgency, and post-trade cost assessment, which does reflect the time horizon determination and price of urgency.

The decision steps in the determination of the trading strategy are as follows:

- setting the horizon for the trade,
- trading a portfolio versus a single stock (dividing the trade list),
- choosing a principal (block), agency, or crossing trade,
- allocating and timing orders, and
- selecting the broker or counterparty.

Setting the time horizon for the trade is probably one of the most important decisions that a trading

desk makes. **Figure 5** depicts how the major components of realized costs, market-impact and opportunity cost, relate to the trade’s time horizon. Market impact, or expected cost, decreases with time, and every stock or every portfolio has a different plot and slope on this line. The other component of trading costs, the opportunity (or delay) cost, looks like risk or tracking error. It also has a time dimension, a range within which the realized trading cost will fall. In pretrade analysis, we draw a picture of the expected market impact and the envelope of opportunity costs. Then, after the fact, we plot a point to see whether the trade’s cost fell within that range and we met our goal.

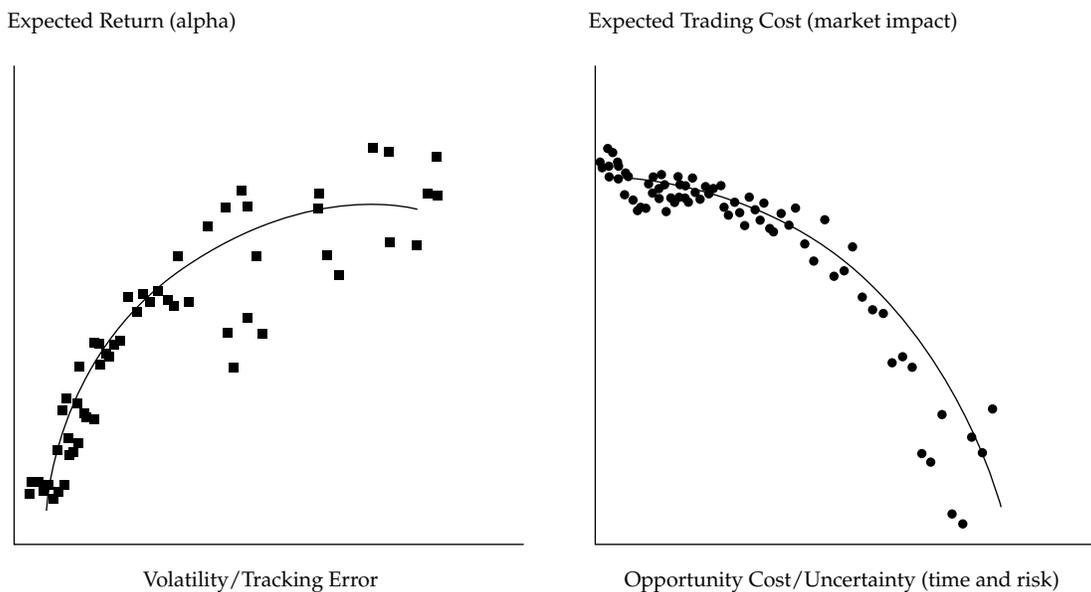
Factors Driving Implementation Shortfall.

The factors that drive the components of implementation shortfall can be grouped into four areas: portfolio characteristics (the major factor in expected trading costs), trading strategy, market dynamics, and client strategy. Portfolio characteristics and trading strategy relate to both market impact and opportunity cost; market dynamics and client strategy relate more directly to opportunity cost than market impact. Portfolio characteristics include such aspects as bid-ask spread, percentage of the volume traded in a day, and recent performance of the stock or portfolio. The choice of a trading strategy often begins after a first pass at cost assessment. The market dynamics that affect the trading decision include index volatility, tracking error, macro-information events, and firm-information events. Important

aspects of client strategy are the strategy itself—value versus growth, quantitative, or active versus passive. Also important is the confidentiality of the trade. Finally, the perceived size of the trade and the urgency of the alpha process (the positioning of the portfolio to earn an excess return) will influence trading costs and, therefore, will also influence implementation shortfall.

■ *Trading and investment decision parallels.* At one point, people believed trading cost measurement was futile because the components of the costs were too complicated. Today, one hears a similar warning about returns: You cannot predict returns, so invest passively. Both returns and trading costs do have forecastable components, but admittedly, results after the fact can be quite different from the predictions. From a series of *ex post* results for returns and trading costs, interpreting whether an investment or trading process was correct is difficult. But *ex post* results are the sole source of information that managers have. In the case of both returns and trading costs, the manager must rely on many observations to make inferences and decisions. To judge which strategy and trading tactics worked, the analyst needs to isolate the impact of the portfolio manager’s and the trader’s decisions versus the uncontrollable factors that affect the results. Attribution analysis is vital in this regard. The analysis of *ex post* trading costs is similar to the analysis of *ex post* returns: Compare

Figure 5. The Trade-Off of Trading Cost versus Cost Uncertainty



results with the benchmarks, look at market conditions, and do the attribution analysis. Despite incomplete information, the analytical process is a beneficial learning experience in and of itself.

The trade-off between trading cost and opportunity cost, or uncertainty, is similar to that between return (alpha) and risk (volatility or tracking error). For trading costs, the factors to be considered are expected cost (market impact) and the risk associated with opportunity cost. Utility functions or trade-offs between market impact and opportunity cost can certainly affect a decision about best execution. As illustrated in Figure 5, by plotting expected trading costs on one axis and opportunity costs/uncertainty (time and risk) for the alternative trading strategies on the other axis, analysts can match their preferences with the optimal combinations available in the market.

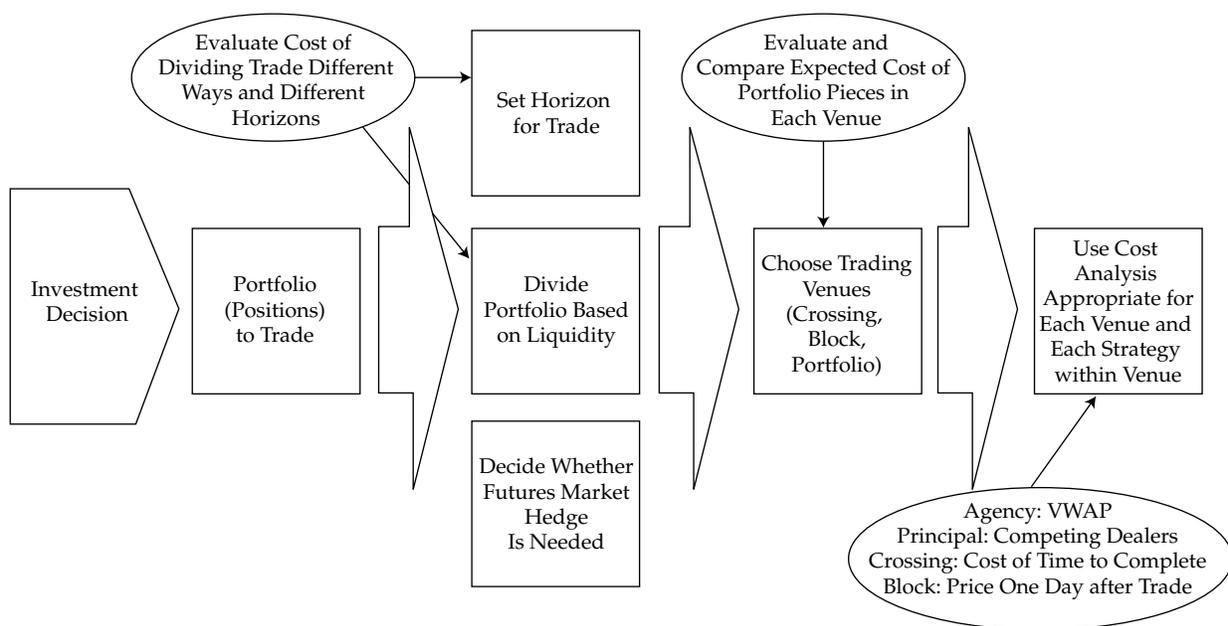
■ *Implementation shortfall analysis.* One method of attribution analysis that incorporates many decisions and stages of the investment process is implementation shortfall analysis. Figure 6 shows the various layers of trading decisions to be measured and to which costs can be attributed. Implementation shortfall is the difference between the value of the executed portfolio and the value of the portfolio at the time the decisions were made. In other words, the analysis measures the impact of the trade and intervening market events on portfolio value. A pension fund or other investor may correctly state that the

most relevant cost measure is what the portfolio loses between the time the investment decision is made and the time the trade is realized. In looking at the trading process, however, as in the investment process, many decisions are made along the way that need to be evaluated. Note that the last box, “Use Cost Analysis Appropriate for Each Venue . . .,” at the end of the process, is the point at which VWAP and the other measures of trading costs can be applied.

Although relevant in judging how a buy-side or sell-side trader “worked” an agency order, VWAP has an obvious weakness as a post-trade measure because it lacks a pretrade counterpart. But what is an expected pretrade VWAP or open/high/low/close? Zero. Are all expected trading costs zero? No. So, these measures measure only the process; they do not help in the decision making prior to the trade or provide a range of target costs.

To narrow down the broad results based on implementation shortfall analysis, one can do several things. First, the trading costs can be separated from market movements, sector movements, and manager style—in the same manner used for investment performance. Second, trades can be characterized by the form of intermediation. The objective of this step is to improve comparisons among trading strategies and execution outcomes. Ideally, for a given ticker symbol, one would like to view the cost of a particular trade and how the execution compared with that of

Figure 6. Decisions and Stages from Investment Decision to Measuring Implementation Shortfall



a portfolio trade, an ECN trade, or a block trade. Finally, benchmarks can be created for comparing trades across trade types.

The best thing about having a cost benchmark is that one can compare actual execution performance with the characteristics of the benchmark. For example, we might have delivered the same cost as the benchmark but with less risk or less variability in cost. So, if we are thinking about making a trade at, say, 10 percent of a day's volume or 10 percent of the order flow, we can identify a time horizon (say, one and a half hours or two days)—a window for which we have some notion of a benchmark trading cost. If we eventually execute the trade within a shorter or longer time frame, we will realize different costs, so we can evaluate the difference between our execution and the benchmark's execution and make attributions on that basis.

Conclusions

The evolution in trading demands, capabilities, appetites for risk, and regulations has had radical effects not only on exchanges but also on brokers. The reac-

tion seems to have been for full-service brokers to become even more full service by expanding their abilities to route, analyze, and process trades effectively and to connect with clients.

The impact of the shifting service package on the business of broker/dealers is complex and not yet obvious. How will these changes affect the earnings and risk profile of the intermediary? Will the changes involve increased risk to dealer capital? I foresee lower costs coming from the removal of some regulatory impediments and also from applications of technology. A firm needs to make a big upfront investment in technology, however, and how quickly the investment will pay off is not clear.

Trading-cost analysis is going to be the key to clients and intermediaries making smart trading decisions. The advances in trading analysis in the next decade will be comparable to the advances in investment analysis of the last decade because broker/dealers will finally have the data, the tools, and the technology to carry out the analysis, if not perfectly, at least better than in the past.

Question and Answer Session

Joanne M. Hill

Question: At a recent Securities Industry Association conference, U.S. SEC Chairman Arthur Levitt mentioned that institutions are paying too much for commissions. Do you agree?

Hill: The statement could be accurate for some trades. The question is how commissions should be set: Should they be the same for all traders? How do we incorporate the broader business relationship, research the manager uses, or the other services we provide in addition to the execution? If we charge the same rate for every trade and that rate includes other services, then Chairman Levitt is probably right that for certain trades, the charge is higher than the cost of executing the specific trade. But the issue is a complicated question of how one should come up with institutional pricing.

Also, I think Chairman Levitt assumes better cost measurement on the part of broker/dealers than actually exists. We need a better grasp of what the costs are of having a relationship with Customer A versus having a relationship with Customer B. We know what the revenue is, but what is the cost? If we could attribute the costs that we incur to a client, we could determine what the real profit (and risk) is from doing business with that client. But although we are getting better at understanding our costs, how to allocate them by client, and

identifying the marginal cost, the analysis is not yet refined enough to say definitively that institutions are paying too much in commissions.

Question: Is the SLK purchase a confirmation that the specialist system will survive?

Hill: Most people interpret our acquisition of SLK as a hedge: If the specialist business survives, we will have access to some of that business. Many full-service brokers have found that the specialist function goes along with other complementary technology investments and services. For example, SLK offers clearing and execution services for professional traders that want to deal directly with the floor. This is an important specialist function that will survive. It is a growing business for SLK as well as the Nasdaq market-making business.

Question: Will your pretrade cost analysis model generate different cost estimates depending on the time dimension—for example, for a million shares traded over five days versus the next hour?

Hill: One of the deficiencies of available pretrade cost models is that they totally depend on stock or portfolio characteristics. They give a false impression of cost to portfolio managers and are dangerous to

put into screening or optimization models because the real cost is specific to the market conditions and the type of trading strategy used. The only way to address that problem and to do a good job at pretrade analysis is to assemble databases, as Plexus has done, of trades executed under various market conditions—a large trade in three minutes versus a large trade in five days, and so on—analyze the costs of those trades, and develop a pretrade model based on the data assembled for different conditions. Having an idea of the benchmark trade is also helpful.

Current approaches to pretrade analysis are useful, but they typically do not incorporate the urgency of the trade. The best way to consider urgency is to use tracking error and some measures of volatility and opportunity cost and to apply those data to the time dimension. For example, you might come up with the risk or the opportunity cost of delaying a trade for several days instead of doing it in three minutes. That approach quantifies the delay costs somewhat. The best way to capture the market impact of doing the trade in three minutes is to represent percentage of trading volume in your model in some way, but ideally, we should use the intraday pattern of trading flow for the stock.